Leaf epidermal morphology of Leucophyllum was studied. A detailed pharmacognostical and phytochemical evaluation was done. The study revealed several interesting characters such as, the trichomes are 110-160µm in height. The lateral spines are 100µm long the cells of main axis are 15µm in height and 20µm breadth. Stomata occur only on the abaxial leaf surface; anisocytic stomatal complex. Mesophyll with calcium oxalate crystals. Others to be mentioned are TPM (Transcurrent Palisade Mesophyll). Thus the above-mentioned leaf features are of great taxonomic significance. Preliminary phytochemical tests revealed presence of alkaloids, steroids, tannin, terpenoids and saponins. This genus is sometimes placed in the family Myoporaceae, hence the present study.

**Key words:** alkaloids, dendroid, epidermal, leaf, Leucophyllum, Mycobacterium tuberculosis, stomata, trichome.

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**INTRODUCTION**

India is one of the mega diversity countries in the world and medicinal plants form the backbone of traditional systems of medicine in India, thousands of tribal communities still use folklore medicinal plants for the cure of various diseases. Indian medicinal plants have been studied for potential source of bioactive compounds. The great interest in the use and importance of medicinal plants in many countries has led to intensified efforts on the documentation of ethnomedical data of medicinal plants. Earlier there were a few or no synthetic medicine and species of higher plants were the main sources of medicines for the world (Duke, 1990). Medicinal plants are the rich source of novel drugs that forms the ingredients in traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates, bioactive principles and lead compounds in synthetic drugs. Neube et al. (2008) Many plants synthesize substances that are useful to the maintenance of health in humans and animals. The experimental plant *Leucophyllum frutescens* (Scrophulariaceae) is given for dysentery, fever, cough, asthma, liver injury, cataracts. The flowers and leaves can be brewed into a pleasant herbal tea which is amid sedative and good for treating flu and colds, the leaves of *Leucophyllum frutescens* have been used for antihepatotoxicity (Balderas-Renteria et al., 2007). Active fractions obtained from Leucophyllum frutescens (Berl.) I. M. Johnst. led to isolation of a new compound with moderate activity against all Mycobacterium tuberculosis strain (anti-TB active) Gloria et al. (2011). Hence the present investigation was undertaken.

**MATERIALS AND METHOD**

The whole plant was collected from Ethiraj College campus, Chennai of Tamilnadu, India identified by botanist of CSMDRIA Chennai, Tamil Nadu. Fresh hand sections were taken and treated with chloral hydrate and phloroglucinol and HCl. Microscopical characters were studied as given by Evans Trease and Evans (1997). Trichomes were studied in epidermal peels of plant parts such as lamina. The material was first soaked in the warm water in order to soften the tissues. The peelings were removed with the help of razor and then stained with dilute solution of saffranin and mounted in 50% glycerine. Epidermal tissues were studied from paradermal sections of lamina in surface view. Microphotographs were taken with the help of Nikon (ECLIPSE E400) research microscope. 250g air-dried powder of the leaf was subjected to 250ml of distilled water, butanol, methanol, chloroform, hexane and ethyl acetate in soxhlet extraction for 8 hours (35-55°C) respectively. The six extracts were concentrated to dryness in a flask evaporator under reduced pressure and controlled temperature (50-60°C) to yield crude residue. The extracts were filtered through Whatman No. 1 filter paper and then concentrated in a vacuum at 40°C using a rotary evaporator. Each extract was transferred to...
Phytochemical analysis was carried out by using the standard procedures described by (Trease and Evans, 1989; Edeoga et al., 2005) with some modifications. Test for Alkaloids: The plant extracts and fractions (0.5 g) were boiled in a beaker containing 40 mL distilled water and then 4 mL of conc. Sulphuric acid was added. The mixture was further boiled for 5 minutes before the mixture was filtered, cooled and added in four test tubes equally. These parts were separately tested for alkaloids using Mayer’s Reagent, Hager’s reagent, Dragentroff reagent and Wagener’s reagent. Any turbidity and precipitates formation with these reagents confirmed the presence of alkaloids (Sofowora, 1993).

Test for Steroids: Two milliliter of acetic anhydride were added to 0.5 g of sample with 2 mL sulphuric acid. The colour changed from violet to blue or green in samples indicated the presence of steroids (Edeoga et al., 2005).

Test for Tannins: Each sample (1 g) was dissolved in distilled water (20 mL) for 5 min. the mixture was filtered and then in 5 mL of filtrate solution, few drops of 1% FeCl3 solution was added, occurrence of blue black or greenish coloration indicated the presence of tannins (Trease and Evans, 1989).

Test for Terpenoids: Five mililiter of each sample was mixed in 2 mL of chloroform and concentrated sulphuric acid (3 mL) was carefully added to form a layer. A reddish brown colouration at the inter face was formed to show positive results for the presence of terpenoids. Test for Saponins: Each sample (2 g) was boiled in 20 mL of distilled water in a water bath and filtered. 10 mL of the filtrates was mixed with 5 mL of distilled water and shaken vigorously for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously, then formation of emulsion was observed (Sofowora, 1993; Edeoga et al., 2005).

RESULTS

i) BOTANICAL DESCRIPTION

*Leucophyllum frutescens* is an evergreen shrub in the figwort family, Scrophulariaceae native to the state of Texas in United States. Popularly called as silver leaf is a shrub with four to eight feet tall with arching branches and woolly, silvery gray leaves, simple, alternate and pubescent. The flowers, lavender to purple, sporadic blooming season throughout the year. Flowers are small but cover entire plant during main flush. The stems are silvery and are very attractive. [Fig.1].

ii) EPIDERMAL CHARACTERS

Adaxial epidermal cells were polygonal in outline but the abaxial epidermal cells are larger and have wavy anticlinal walls the cells appear amoeboid in outline. Stomata anisocytic stomata surrounded by three unequal subsidiary cells. Guard cells broadly elliptical in outline 25x40µm in size [Fig.2].

Unique type of dendroid non glandular epidermal trichomes are abundant on both upper and lower epidermal layers the trichome consists of vertical zig zag row of cells from these cells arise the lateral long thorn shaped long unicellular straight spiny trichome the entire trichome looks like a miniature tree, the trichomes are 110-160µm in height. The lateral spines are 100 µm long the cells of main axis are 15µ m in height and 20µm breadth [Fig.3].
TABLE I: PHYTOCHEMICAL CONSTITUENTS OF LEUCOPHYLLUM FRUTESCENS

<table>
<thead>
<tr>
<th>Name of the phytochemical</th>
<th>Methanolic extract</th>
<th>Hexane extract</th>
<th>Chloroform extract</th>
<th>Ethyl acetate extract</th>
<th>Butanol extract</th>
<th>Aqueous extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tanins</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Terpenoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saponins</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Calcium oxalate crystals or druses common in leaf, crystals are spiny spherical distributed throughout the mesophyll [Fig.4].

FIG:4 MICROMORPHOLOGY OF LEAF

iii) LEAF ANATOMY
The leaf is bifacial with flat adaxial and semicircular abaxial side. The palisade mesophyll cells of the lamina are horizontally transverse between the adaxial epidermis and vascular bundle (TPM). The ground tissue in the abaxial part of the midrib is collenchymatous. The vascular bundle is large centrally placed, collateral surrounded by large circular parenchymatous bundle sheath cells. The xylem elements are narrow, angular and thick walled, phloem below the xylem, small and compact.

iv) PHYTOCHEMICAL CONSTITUENTS
The methanolic extract showed the presence of alkaloids, steroids, tannins, terpenoids and saponins hence was more promising than other extracts. (Table 1).

DISCUSSION
The family Myoporaceae is characterised by glandular trichome, Sauren Das (2013) while Leucophyllum has non glandular dendrite trichome. The epidermal cells are not wavy, stomata anomocytic in myoporaceae while Leucophyllum has anisocytic stomata with anticlinal cell wall pattern epidermal cells in abaxial side. Cuticle conspicuous in Myoporaceae while absent in members of Scrophulariaceae. The above characters supports this genus to Scrophulariaceae rather than Myoporaceae. The taxonomic value of trichomes has long been recognized by number of workers Kadry Abdel Khalik (2005), Leelavathi and Ramayya (1983). The present investigation was taken up with a view to study the taxonomic value of epidermal appendages. The chemical constituents and biological activities of Corydalis crispa (Fumariaceae) were investigated and the phytochemical study reported nine compounds: isoquinoline alkaloids: protopine, 13-oxoprotopine, 13-oxocryptopine), stylopine, coreximine, rheagenine, ochrobirine, sibiricine and bicuculline while the fractionation of the hexane:ethyl acetate (1:1) extract of the leaves of Leucophyllum frutescens (Berl.) I.M.Johnst (Scrophulariaceae) led to the isolation of its phytotoxic constituents diayangambin, epiyangambin, diasesartemin and epishantin (Ramando A.M et al., 1999). Hence the genus falls under Scrophulariaceae, the fig wort family rather than Myoporaceae or Fumariaceae.

REFERENCES
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